

## ***Green Power and Performance in Global Environmental Governance***

Babette Never

From 10 to 11 June 2013, the Global Green Growth Summit will take place in Seoul. Policymakers, international organizations and experts from various fields will once again discuss how the transformation toward a green economy and more sustainable development paths can be managed.

### **Analysis**

Global environmental governance is characterized by a high number of international activities, but actual environmental outcomes vary. The ability to develop green political and economic power that leads to better environmental performance is not restricted to industrialized countries anymore. China, South Korea, Brazil and India are slowly catching up, while some small developing nations have also begun to generate power for a green change.

- The heterogeneous behavior of the emerging economies undermines their green power in central environmental regimes. This heterogeneity is reflected in their differing development of green power outside of the internationally negotiated treaties.
- “Green power” refers to the ability to successfully combine technological capabilities, environmental innovations, political and economic power. None of the central actors currently possess it in a way that positions them as leaders in smart global environmental governance.
- In the climate negotiations, China and the United States are in a balance of power that is negative for the environment. China has surpassed the United States in the use of clean technology. However, it still lags behind in achieving better environmental outcomes.
- Costa Rica, Norway and Ecuador have accumulated some green power in spite of their respective economic sizes, bolstering it with good environmental performance. Nonetheless, in the global distribution of power, this is hardly relevant.
- Neither Europe nor Germany currently uses its full green power potential. Both are restricted by hesitant behavior, a drop in new investments in clean technology and innovation as well as China’s structural power gain.

*Keywords: environmental performance, climate change, emerging economies, environmental innovation, global power shift*

## Change through Green Power?

Global environmental governance is constituted of a variety of environmental regimes, state and nonstate actors working internationally and domestically toward a green economy and sustainable, low-carbon development. Some of their actions are more effective than others. Some countries perform very well in terms of actual environmental outcomes, while others lag behind. This split no longer mirrors the North-South divide.

Particularly in the clean technology markets, shifts toward the Global South have become increasingly visible. This challenges the dominance of previous environmental leaders among the industrialized countries – such as Germany, Denmark and the United States. Chinese and Indian solar and wind energy companies, for instance, have caught up with the technological frontier and have begun to substantially increase their market shares (Ren21, 2012). No matter what kind of green transformation societies aim for, it is clear that environmental innovation and clean technology have to provide a significant part. Current and prospective increases in environmental resource use and demand, rising greenhouse gas emissions and the impacts of climate change cannot be managed sustainably with existing technologies and processes. But what type of power is necessary for successfully managing the required changes? Who has the kind of power necessary and when is it actually effective? The concept of green power helps answer these questions as it is intrinsically linked to environmental performance and transcends disciplines. In this article, green power always refers to the types of economic and political power that draw on different resources and processes; it does not relate to the transmission of energy and electricity.

The following features of green power provide the starting points for the analysis:

1) Green power is multidimensional. Instrumental power enables an actor to directly influence or coerce others. Structural power allows an actor to shape the context and rules affecting others according to his own interests. Discursive power permits an actor to indirectly shape the identity, perceptions and preferences of other actors. These three faces of power (Lukes 1974) entail hard and soft resources.

- 2) Green power is relational; it always exists in relation to others and thus needs to be understood as a process in a certain context.
- 3) Green power captures the share of global commons a country possesses as well as a country's ability to make use of this share in international negotiations and/or to attract external funding for its protection.
- 4) Green power incorporates a country's technological capabilities and its absorptive capacity for environmental innovations.

If actors possess green power in one or more of these dimensions, it does not necessarily mean they actively use it. Passive behavior can have widespread consequences, especially regarding global public goods such as the global climate. The climate regime therefore provides a prominent illustration of this behavior.

## Power Distribution in the Climate Regime

In the climate regime, it is no longer the case that only the industrialized countries are in strong structural power positions. Developing countries with significant greenhouse gas emissions now have structural veto power due to the fact that any new climate treaty would be ineffective without their participation. This group includes the so-called BASIC countries (Brazil, South Africa, India, China) and other emerging economies such as Mexico, South Korea and Indonesia. Smaller developing countries mainly have discursive power. At the climate conference in Doha in December 2012, bureaucratic processing was at the forefront instead of political maneuvering, leaving the underlying power distributions largely intact.

The structural power of Brazil and Indonesia in the climate regime differs somewhat from the other emerging economies because of the large amounts of rainforests they harbor. In the past, the rainforest nations exerted instrumental power by successfully setting a financial compensation mechanism for forest conservation on the negotiation agenda (Reducing Emissions from Deforestation and Forest Degradation [REDD]). Papua New Guinea and Costa Rica have been particularly active in this regard (Lederer 2012). In Doha, Papua New Guinea pushed for the establishment of a REDD committee, but the issue was postponed until the 2013 negotiation rounds.

The heavyweights of Brazil and Indonesia still support REDD, but both are now active in other channels in case the climate regime fails. Both countries have set up national trust funds that finance local forest conservation and afforestation projects to which donor countries have already made substantial pledges. Ecuador and Guyana have followed suit. This limits the structural power of the rainforest coalition in the international negotiations and presents a particular disadvantage to those countries that do not have the means to simultaneously pursue their interests within and outside of the regime. Therefore, it is not possible to speak of a general rise of the South in the climate negotiations (Lederer 2012).

Moreover, BASIC is not as homogenous a group as it seems (Hallding et al 2011). BASIC exerted some direct instrumental power at the Copenhagen negotiations in 2009 when it managed to overrule the EU and shape the Copenhagen Accord largely in line with its own interests. However, differences in power and the relational quality of power have become more apparent since then – both between the BASIC countries and between them and their respective regions. In addition, BASIC's power is limited by the structural and instrumental power of the industrialized countries and the moral-discursive power of the Least Developed Countries (LDCs) and the Alliance of Small Island States (AOSIS), who will be hit hardest by the impacts of climate change even though they have not caused it. Furthermore, unlike BASIC, they are not responsible for accelerating climate change with their current levels of emissions. While this has led to a sense of responsibility and financial support by some industrialized countries, the framing of international equity has not yet turned into substantial financial commitment by all industrialized countries. The LDCs, the AOSIS and other emerging economies – such as India – emphasize that the industrialized countries are largely responsible for climate change and should therefore not only mitigate their own emissions, they should also help the poorer countries adapt to the impacts of climate change. In Doha, only the EU, Germany, France, the UK, Denmark and Sweden announced concrete financial pledges until 2015.

Brazil and South Africa are generally more open to binding mitigation targets than India and China. Due to internal discrepancies over the extent and calculation of voluntary commitments

(BASIC Experts 2011), among other things, BASIC is missing out on the possibility to strengthen its power position as a group. In relation to India, China has more active discursive power, even though it did not use it in Doha. Right at the beginning of the Durban negotiations in 2011, the Chinese government signaled that it would take part in a post-2020 climate treaty - even though it did not use it in Doha. India is more reluctant. After the promotion of the rather progressive minister of environment and forests, Jairam Ramesh, to another portfolio in July 2011, India began to fall back into blocking mode. This promotion therefore needs to be seen as a de facto dismissal. In contrast to the other three BASIC countries, India's power derives less from active shaping and influencing than from blocking. The only exception is its active engagement for the setup of a center for clean technology. Technology transfer is clearly in India's interest. Furthermore, similar to China and South Africa, the veto power of the domestic coal and oil industry should not be underestimated. The chances are rather low that India will be successful in its calls for greater equity by strengthening its instrumental and structural power position with new partners. Even together with the LDCs, the establishment of a discourse on climate justice has not been successful in shaping the climate regime in a decisive way (Roberts 2011).

China and the United States are in a negative balance of power. Neither of them will take a decisive step forward in the climate negotiations without the other doing the same. Both countries are in an extremely strong power position that could be used to shape the prospective climate regime. However, they do not use this potential due to domestic political and economic reasons. The likelihood of passing any kind of federal climate policy through the US Congress is currently very low, even though various actions are being taken at state and local levels. In the short term, the balance of power between the United States and China in the international negotiations impedes political leaps forward.

In the past two to three years, only the EU has possessed and used some clear instrumental power. At present, it does not use it as actively as before. The increasing internal disaccord between member countries is weakening previous power gains, particularly due to the defensive stance of Poland. In Doha, the EU achieved its goal to make

the second commitment period to the Kyoto Protocol ready for ratification but did not opt to unilaterally raise its emission reduction targets. Moreover, the EU slightly increased its moral-discursive attraction among developing countries, being one of the few negotiating parties that continued so-called fast-start finance beyond 2013. Neither the EU as a whole nor Germany separately possesses more or less structural power than the other major players in the current climate negotiations. However, neither uses its full power potential, which is evidenced by their continued failure to apply pressure to their traditional transatlantic allies – the United States and Canada. The EU's quest for leadership in the climate regime is thus overshadowed by greater diplomatic/strategic alliances.

The exit of Canada, Russia, New Zealand and Japan from the Kyoto Protocol has two sides to it. On the one hand, the Kyoto Protocol has been saved from complete failure. This can be interpreted as the successful application of direct instrumental power by the supporters of the protocol. On the other hand, their exit is detrimental to the managing of climate change due to the high emissions and the resulting structural power that Canada, Russia and Japan hold. In Doha, there were fierce power and interest struggles concerning the transfer and sale of any surplus emission rights from the first Kyoto period to the second. The resulting compromise only allows those countries participating in the second period to transfer and sell their surplus rights. This is a slight instrumental power gain for beneficiaries such as Poland, but a power loss for Russia. At the time of writing, it remains unclear whether Belarus, Ukraine and Kazakhstan will also leave the Kyoto Protocol. In any case, the climate regime has been further weakened by the numerous withdrawals.

South Africa is torn between the interests of BASIC, legitimating itself as a representative of sub-Saharan Africa and the demand to be a reliable partner for the North (Atteridge 2010). South Africa's power is generally smaller than that of the other BASIC countries, but greater in relation to its region. This greater power related to its region primarily derives from the discursive dimension, as the country managed to foster transparency and the participation of the LDCs and civil society organizations in Durban 2011. But the capacity to produce a feel-good effect by holding traditional African participatory meetings (*Indabas*) will

not limit global warming. It is becoming harder for South Africa to maintain its bridging function between industrialized and developing countries.

The breakup of the G77 into the LDCs on the one hand and BASIC and other emerging countries of the South on the other has become increasingly obvious. In 2012, the developing countries divided into different groups. The LDCs and AOSIS remain as negotiating alliances, while Colombia, Peru, Chile, Costa Rica, Guatemala and Panama formed the new Association of Independent Latin American and Caribbean states (AILAC). The AILAC calls for the mitigation of emissions by industrialized and developing countries as well as an incentive system to do so for all countries. Opposing the AILAC is the new Like Minded Group of countries, which is comprised of members of the Arab Group, Argentina, Venezuela, Bolivia, Ecuador, India and China. This latter group continues to advocate for international equity and the historical responsibility of the industrialized countries (ENB 2012). These alliances have started to shift the relational power between negotiating parties. As it stands, however, no gain in power that would change the general standoff in the negotiations is expected for any negotiating party.

### **Green Power through Clean Technology**

The distribution of green power in the climate regime converges only partially with current developments in the global clean technology markets. In 2012, China led global new investments in clean technology with \$67.7 billion, followed by the US with \$44.4 billion. Germany thus dropped from second place, which it achieved in 2011. New investments in India declined by 44 percent compared to the previous year as a result of fewer solar project approvals and the end of the domestic incentive scheme for wind power. Australia, South Africa, Morocco, Ukraine, Mexico, Kenya, Brazil, Ethiopia, Chile and South Korea were among the countries to see at least one project of more than \$250 million financed during 2012 (Isola/Zindler 2013). In 2011, the United States and Europe led government and corporate research and development (R&D) expenditure in renewable energy. While Brazil and India stood out among the emerging economies, China was and still is the only country that is on its way to reach-

ing the same levels of R&D expenditure as the industrialized countries.

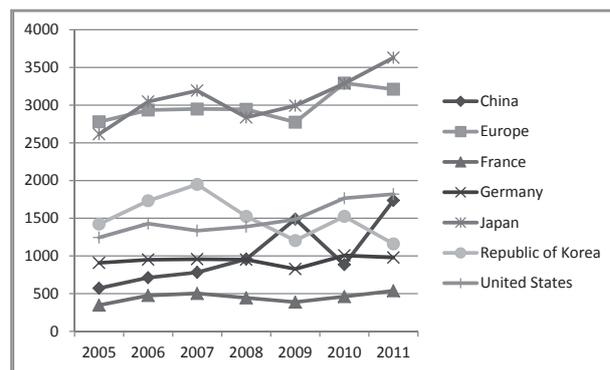
Several Chinese and Indian solar energy and wind energy companies rank among the top 10 globally (Ren21, 2012). Together, Chinese companies have a 30 percent share of the global market for wind turbine production. Moreover, China has the highest installed wind capacity in the world with 63 MW, followed by the United States, Germany, Spain and India.<sup>1</sup> Among the top 15 global producers of photovoltaic (PV) cells, 7 are Chinese corporations. European and US PV producers have become increasingly concerned by the Chinese competition, which already produces 55 percent of PV cells globally. This saw the United States begin to impose low-level import tariffs on Chinese solar cells in 2012. Following a lawsuit by European solar firms (among them the German producer SolarWorld), the European Commission initiated an antidumping procedure against Chinese producers in September 2012. In May 2013, the Commission agreed to impose an average import tariff of 47 percent on Chinese solar panels starting in June 2013. At the time of writing, this decision was up for debate among the EU member states.

China's structural power – and to a lesser extent that of India – has greatly increased in the wind and solar markets. It is opposed by Europe's structural power, especially that of Germany. In the short term, the shift of the global renewable energy market has resulted in a loss of structural power in environmental governance for Germany and Europe. In the long run, however, the reduction in the number of German companies to those with a substantial technological advantage could be beneficial. With Chinese PV cells now comparable to German products in terms of quality, German renewable energy and energy efficiency companies must improve technologically to secure Germany's structural power in global environmental governance. This can only be achieved through more investment in R&D and a systematic use of green innovation potential, which is likely to be more effective if targeted at fewer technologically advanced companies. Overall, Germany, the United States and Europe still invest far more in R&D than the emerging economies of the

South (Kappel/Pohl 2013). However, the solar industry has been neglected in this regard.

Patents in environmental technology indicate the technological capabilities of a country – a cornerstone of its green power. Between 2005 and 2011, Japan and Europe led in innovations in green technology (Figure 1). They were followed by the United States and South Korea, which have been caught up over time by China. Among the top 20 countries, China is (apart from Russia) the only emerging economy; this underlines the general increase of its power in global environmental governance in this green power dimension as well. However, the continued dominance of European and developed Asian countries along with the United States supports the active green power of these countries' governments and their companies in the global market.

**Figure 1: Leaders in Environmental Technology Patent Grants 2005–2011**



Source: World Intellectual Property Organization Statistics Database.

For those developing countries that are already participating in clean technology markets, the structural power and the economic dominance of Asian, European and US companies are too strong. Even though investments are partly increasing and more renewable energy and energy efficiency projects exist, they have not been able to influence this area of global environmental governance yet. Only some of the emerging economies and the industrialized countries are therefore able to strengthen their overall active green power through innovation and market share in clean technology. These results confirm that a differentiated view on the global economic performance potential of emerging economies is required, as provided by the Global Performance Indicator (GPI) (see Kappel/Pohl 2013). The GPI clarifies that only some of the emerging economies have the po-

<sup>1</sup> World Wind Energy Association, *World Market Recovers and Sets New Record*, 7 February 2012, Online: <[www.wwindea.org/](http://www.wwindea.org/)> (accessed 12 February 2012).

tential to catch up with the industrialized countries and to play a truly influential role in global governance. However, not all emerging economies that stand out in the GPI – such as South Africa and Vietnam – are developing into well-performing green powers.

### Does Green Power Lead to Better Environmental Performance?

The Environmental Performance Index (EPI) measures how close countries are to attaining their established environmental policy goals in 10 policy categories concerning environmental stresses to human health and ecosystem vitality. The EPI uses 22 indicators that are weighted, aggregated and then compared to the respective policy goal taken from national regulations and international treaties (Emerson et al. 2012). Table 1 lists the EPI ranks of the central actors discussed here and provides additional data for the development of greenhouse gas emissions. Fossil fuels and emissions stemming from deforestation make up the majority of countries' greenhouse gas emissions. The deforestation rate is an indicator of the emissions from deforestation.

**Table 1: Environmental Performance of Key Actors**

	EPI 2012 rank	CO <sub>2</sub> emissions <sup>a</sup> (total in million tons)
United States	49	5 368.6
China	116	7 258.5
EU	-	3 659.5
Germany	11	761.6
Norway	3	39.2
India	125	1 625.8
Brazil	30	387.7
South Africa	128	346.8
Indonesia	74	410.9
Japan	23	1 143.1
South Korea	43	563.1
Costa Rica	5	6.5
Ecuador	31	30.1
Colombia	27	1 310
Papua New Guinea (for the AOSIS) <sup>c</sup>	124	3.4

	CO <sub>2</sub> emissions <sup>a</sup> (kg/capita)	Deforestation <sup>b</sup> (% annual change 2005-2010)
United States	17 312	+ 0.13
China	5 395	+ 1.39
EU	7 294	Not available
Germany	9 315	0
Norway	8 011	+0.78
India	1 388	+0.21
Brazil	1 989	-0.42
South Africa	6 938	0
Indonesia	1 713	-0.71
Japan	8 974	+0.04
South Korea	11 521	-0.11
Costa Rica	1 403	+0.90
Ecuador	2 081	-1.89
Colombia	60499	-0.17
Papua New Guinea (for the AOSIS) <sup>c</sup>	500	-0.49

<sup>a</sup> CO<sub>2</sub> emissions from fuel combustion. Source: International Energy Agency 2012.

<sup>b</sup> “-” signifies deforestation, “+” indicates afforestation. Source: FAO 2012.

<sup>c</sup> 2009 is the latest year available. Source: World Bank.

In 2012, the top five performers were Switzerland, Latvia, Norway, Luxembourg and Costa Rica. This reveals that the central actors with large amounts of green power in the climate regime and/or clean technology markets do not all automatically perform well. China has a very low EPI rank in spite of its rising position in the clean technology field. Its high carbon emissions have put the country in a power position in the climate negotiations. But they have also created the necessity for China to improve its environmental performance, rather than simply investing in clean technology. While the Chinese government has managed to successfully implement afforestation programs, the sheer extent of increasing local environmental challenges has limited the possibility to turn passive green power into active green power; India is in a similar position. Brazil's fairly good EPI rank is overshadowed by its high deforestation rate. If it managed to halt this deforestation, the country would benefit from a far stronger green power position, making up for the comparably low amount of innovation in clean technology.

Some smaller countries – such as Costa Rica, Norway, Colombia and Ecuador – have performed very well. Ecuador has even managed to turn its high deforestation rate into an advantage, thus accruing green power. Therefore, it cannot be assumed that only industrialized countries man-

age to develop green power on the way toward green transformation. However, these smaller countries' play a largely insignificant role in terms of clean technology innovation and the corresponding market development. Here, Germany, Japan and South Korea back up their green power with good environmental performance. However, none of them use their green power potential in the climate regime to the full extent; Japan in particular keeps a low profile in the climate negotiations.

### The Future of Green Power

None of the central actors discussed here possess active green power in all dimensions. In general, the industrialized countries still have and could exert more green power – although China, Brazil, India and even Costa Rica are catching up in some areas. China's power is generally increasing in the structural dimension, but the country does not use its instrumental and discursive power in the negotiations to establish a global leadership position. Instead, China is situated in a balance of power with the United States. India is the poster child of veto power. It is less successful in the discursive dimension, but seeks to increase its power in the structural dimension outside of the climate regime. In principle, Europe and Germany have the potential to become leading green powers, but they are too hesitant and find themselves restricted by China's structural power gain. Most of Germany's structural power stems from the renewable energy sector but is being increasingly challenged by China and India.

The differentiation between active and passive green power is particularly relevant in the current polycentric environmental governance system. A country may behave passively in international negotiations, but actively build and exert its green power at other levels and through other channels. Moreover, changes in global environmental governance have made it clear that green power is not necessarily related to the economic relevance of a country. There are different paths available for a green transformation, which correspond to the differing cores of a country's green power and domestic context factors. Technological capabilities and structural power are likely to increase a country's green power, while moral-discursive power alone will not suffice for the

development of substantial green power. For the moment, it remains an open question which combination of green power elements leads to the smart governance of the environment measured by better environmental performance.

### Literature

- Atteridge, Aaron (2010), *Multiple Identities: Behind South Africa's Approach to Climate Diplomacy*, SEI Policy Brief, Stockholm.
- BASIC Experts (2011), *Equitable Access to Sustainable Development. Contribution to the Scientific Body of Knowledge*, Beijing (u.a.), online: <[www.erc.uct.ac.za/](http://www.erc.uct.ac.za/)> (30 March 2012).
- Emerson, John W., A. Hsu, M.A. Levy, A. de Sherbinin, V. Mara, D.C. Esty, and M. Jaiteh. (2012), *2012 Environmental Performance Index and Pilot Trend Environmental Performance Index*, New Haven: Yale Center for Environmental Law and Policy.
- ENB (2012), *Earth Negotiations Bulletin*. Winnipeg, International Institute for Sustainable Development.
- Hallding, Karl et. al. (2011), *Together Alone: BASIC Countries and the Climate Change conundrum*, Copenhagen, Nordic Council of Ministers.
- Isola, James, and Ethan Zindler (2013), *New Investment in Clean Energy Fell by 11% in 2012*. Bloomberg New Energy Finance, Press Release, 14 January 2013.
- Kappel, Robert, and Birte Pohl (2013), *Der wirtschaftliche Aufstieg der BRICS-Staaten*. GIGA Focus Global, 1, online: <[www.giga-hamburg.de/dl/download.php?d=/content/publikationen/pdf/gf\\_global\\_1301.pdf](http://www.giga-hamburg.de/dl/download.php?d=/content/publikationen/pdf/gf_global_1301.pdf)>.
- Lederer, Markus (2012), *Die Macht des Südens in der globalen Klimapolitik*, Manuskript, DVPW Tagung Politik und Ökonomie in globaler Perspektive: Der (Wieder-) Aufstieg des globalen Südens, Frankfurt.
- Lukes, Steven (1974), *Power: A Radical View*, London: Macmillan.
- REN 21 (2012), *Renewables 2012 Global Status Report*, Paris: REN21 Secretariat.
- Roberts, Timmons J. (2011), Multipolarity, and the New World (Dis)Order: US Hegemonic Decline and the Fragmentation of the Global Climate Regime, in: *Global Environmental Change*, 21, 3, 776-784.

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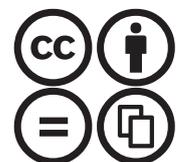
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Pohl, Birte, and Peter Mulder (2013), *Explaining the Diffusion of Renewable Energy Technology in Developing Countries*, GIGA Working Papers, 217, online: <[www.giga-hamburg.de/workingpapers](http://www.giga-hamburg.de/workingpapers)>.  
Never, Babette (2013), *Towards the Green Economy: Assessing Countries’ Green Power*, GIGA Working Papers, 226, online: <[www.giga-hamburg.de/workingpapers](http://www.giga-hamburg.de/workingpapers)>.  
Never, Babette (2012), Who Drives Change? Comparing the Evolution of Domestic Climate Governance in India and South Africa, in: *Journal of Environment and Development*, 21, 3, 362-387.  
Prys, Miriam, Jörg Balsiger, and Niko Steinhoff (2012), *The Nature and Role of Regional Agreements in International Environmental Politics: Mapping Agreements, Outlining Future Research*, GIGA Working Papers, 208, online: <[www.giga-hamburg.de/workingpapers](http://www.giga-hamburg.de/workingpapers)>.



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